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ABSTRACT

Book excerpts, editorials, poems, speeches, newsletter and journal articles, and congressional testimony are compiled in this anthology to aid in the understanding of environmental education and environmental awareness. Major items include: "Poems and Other Expressions of Environmental Concern" by Morton Leeds; "Man, Nature, and the Ecological Perspective" by Michael Lacey, Director, Woodrow Wilson International Center for Scholars, Smithsonian Institution, Washington, D.C.; "The Biosphere" by Rene Dubos; "Survival of Plants and Man" by Lewis Mumford; "The Ecological Point of View" by Roland Clement, Vice President, National Audubon Society; "The Lack of Reverence for Nature" by Coleman McCarthy, editorialist, Washington Post; and "A New Sense of Husbandry" by Clay Schoenfeld, professor, University of Wisconsin, Madison. (BL)

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UNDERSTANDING

ENVIRONMENTAL EDUCATION

A COLLECTION OF READINGS IN

ENVIRONMENTAL AWARENESS

Office of Education
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Washington, D.C. 20202

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The Ecologue

1. Thou art one with the tissue of life,
a seamless web that encircles the earth;
thou shalt repair a tear in it
wherever it occurs.

2. Thou art but the conscious dust, a sharper
but never the master of nature.

3. Thy creations also come from dust;
unto dust shall they return,
for waste is just an unused stage
that thou must learn to use.

4. Thou shalt forever serve as
thy brother's systems keeper,
for man in the mass is but a part man.

5. Thou shalt forever remember
that earth is the oasis of life
in the desert of space;
thou must never turn earth to moon.

6. Thou shalt pay the tomorrow tithe
that thy children and thy children's children
may continue the privilege of living on earth.

7. Thou shalt fashion and use a timeglass
that measures decades,
centuries and millenia.

8. Thou shalt further remember:
the wants of man are infinite,
the resources of earth are not.

9. Thou shalt neither make nor disperse
the lifeless foes of life on earth.

10. Though the purpose of life may be mysterious,
thy very existence answers death
and the ending of all things.

This is the house that Jack built

T This is the grass
H Around the house that Jack built
I
S These are the bugs
That live in the grass
I Around the house that Jack built
S

This is the bird
T That ate the bugs
H That live in the grass
E Around the house that Jack built.

H This is the cat
O That swallowed the bird
U That ate the bugs
S That lived in the grass
E Around the house that Jack built

T This is the dog
H That bit that cat
A That swallowed the bird
T That ate the bugs
That lived in the grass
J Around the house that Jack built
A
C This is the child so sweet and mild
K That stroked the dog
That bit the cat
B That swallowed the bird
U That ate the bugs
I That lived in the grass
L Around the house that Jack built
T

This is the mother half beguiled
That loved the child so sweet and mild
That stroked the dog
That bit the cat
That swallowed the bird
That ate the bugs
That lived in the grass
Around the house that Jack built

This is Jack who sprayed the field
Surprised to find his wife half wild
With a sick, unhappy, nauseous child
Who had played in the grass
And stroked the vomiting dog
That bit the paralyzed cat
That swallowed the poisoned bird
That ate the dying bugs
That lived in the beautiful grass
Around the house that Jack built.

Neighbor

My squalid-souled neighbor
Ordered her three great
Thirty-year old willows
That sat four feet inside her border
Cut down today. She did not
Stay around to watch the slaughter
By the hired woodsmen, who performed
Their work well. Disrobed, disarmed
Dislimbed the trees. Sliced the thick
Trunks into neat cylinders, rolled
Them away in the barrow to the truck.
The noise of the saws sliced my skull
As well. I do not understand.
Because we can
Perform an act
Must
We do it too?
She cleared the air, for sure
I can see the sky, and as far as I
Am concerned, I hate her pure
And unambivalent. We're busy now
Shopping for three other trees
That will be placed four feet inside
Our side of the invisible border line.

Ecologist

So now the razors last six months
The radials last forty thousand miles
While my oil lasts four thousand miles
The women look better at fifty
Than their mothers did at thirty
We can jet three hours from coast to coast
Men monthly run a four-minute mile
Diphteria and polio are gone
An American has landed on the moon
Our physical accomplishments are legion.

But what is that irritating mist
That hovers over each major city?
Why are fifty thousand tons of DDT
And countless tons of lead and mercury
Oozing yearly with the mud to the sea
Yes, and why is death eating
At the Great Coral Reef?

For along with the bugkill
the birdkill
the fishkill
Are the mankill
the mankill
In the fields
On the roads
In the cities
In the towns
And what has happened
To the threads that bind community

Ecologist's Lament

First you plant the world green, yes a grassy green
From a Garden of Eden to a Mediterrean
From a Kazakhstan to Saskatchewan
Then you turn men loose all over to farm

Refrain

Furrow, plant, reap and abandon
To be sand, to be sand, to be sand

Now you strip the trees and the bushes from the land
and you turn the soil, the gift of God's hand
And you plant one crop till the soil runs out
And you free the goats and the sheep to browse

Refrain

With the minerals gone there's a drop in yield
So you push farther on to another field
While the wind and the rain and the rivers do their work
and the sun makes a desert of the uncovered earth

Refrain

Now the Gobi, Arizona, Central Asia and Sahara
The Arabian, Australian, Kalarari
When man starts carelessly turning up the ground
And the land is abandoned, then the sand blows around

Refrain

Now the Bible lands show what has been done
What could be done and what should be done
But industry has now overtaken the farm
And industry we know can do no harm

Refrain

Soon you'll farm the poles and you'll farm the sea
And you'll farm the tundra for you and for me
And when you get through with the Continental Shelf
Old Mother Earth won't recognize herself

Refrain

But where can you go when you've wrecked this place
There's no worse desert than empty space
Perhaps you should adopt as your cause
LOVE THIS EARTH OR LEAVE IT AS IT WAS.

Exterminator

Liquid death

Powdered death

Death to bugs and birds and fish

Death to man

Death to life

Is this our secret silent wish?

Statistician

The lines on every chart now rise

Pointing their arrows

Toward the asymptote high high

Numbers of all men

Water that men drank

Refuse men create

Energy men use

Speed that men can fly

The lines all point up

Toward the sky

(oh, Great If-Thou who art

out there see'st Thou

the arriving end of every chart?).

Little Miss...

Little Miss Muffet
Sat on a tuffet
Eating her curds and whey
There's no longer a spider
To sit down beside her
For bugs are now all done away.

Environment

The Devil's Disciple's Dictionary

Breathe - To inhale noxious elements, and exhale pure chemicals, leaving the residue witin the lungs.

Conservation - Good housekeeping on Spaceship Earth.

DDT - Dusty death's ticket.

Defoliate - To strip leaves from the trees and pride from our side.

Ecology - The study of the earth's thin delicate living skin.

Engineer - A Roman who believes that the road to salvation is paved.

Environment - The dirty blanket we wrap ourselves in.

Exhaust - Automotive flatulence, an essential component in the mass production of one of the major domestic industrial products of contemporary America, smog.

Fallow - Fortunate enough to be neglected by man.

Grass - Nature's stubborn green hair which grows with a mind of its own; forms part of the triad, along with bushes and trees, that amends man's presence on this planet.

Hearing - A search for meaning amidst noise.

Image - The outer or most important aspect of reality.

Inexhaustible - Formerly thought true of the world's resources; now recognized as true of the sum total of human wants.

Lawn - A much-desired homogenized green vegetable fuzz, produced by exterminating all animal life around it.

Leaf - A small, flat, pointed green energy factory, produced in vast quantities by tall, fibrous vegetables called trees. When they terminate production of energy, they turn brown and fall (hence the man), requiring human energy to be expended in their gathering and disposal, by usually unsatisfactory means.

Maintenance - The constant probing of the city's intestines through the concrete, to determine whether they are still there. The effect of this process upon the city's circulation, however, is but dimly understood.

Muffler - A noise net whose effectiveness is only recognized when it is defective.

Nature - The mother of God, as distinguished from man, the father of God.

Park - A green, pleasant, and unsafe place to walk; generally kept dark at night, to assure its continued status.

Parking lot - A temporary sheet of asphalt, covering a piece of recently cleared land awaiting approval for its next occupant.

Pollution - The broken water closet of Spaceship Earth.

Rat - A small, four-legged mammal, as ubiquitous, clever, useless and dirty as man; the rat, however has a tail.

Reactor - Part of a panel that builds up heat without exploding.

River - A dead but still-moving body of water, that carries soluble wastes down to the sea.

Sign - A clearing in the jungle of confusion; a windshield-wiper in a storm. On superhighways however, they are white-speckled green birds that float by, leaving confusion in their wake.

Smog - A soup in which man marinates; a man-made substance intended to counter the effects of longevity and public health planning, since it produces black lung, pink eye and smoker's cough.

Social distance - The distance at which people begin to find each other truly repulsive; since perception may be dulled by some cultures, social distance varies from place to place.

Solid waste - The ash and trash we smash and splash all over the countryside.

Suburb - A newly homegonized corner of the city that provides a temporary respite from its problems.

Traffic light - A mechanism for regulating the flow of a city's arteries; it consists of two sections, one red and one green; the red is always timed to last longer than the green.

Tree - Nature's gentle attempt to correct man's architectural mistakes.

Water - A clear, unpalatable liquid, usually mixed with other liquids or powders, to render it potable, and as such, necessary for life.

MAN, NATURE, AND THE ECOLOGICAL PERSPECTIVE

by Michael J. Lacey*

The term ecology was coined a century ago by the German zoologist, Ernst Haeckel. Haeckel's aim was to establish a logical scheme for the life sciences; and he built his term on the Greek oikos ("home," "dwelling place") to refer to the relationships between organisms and their environment, both living and non-living. The debut was modest, almost to a fault, and while the years that followed have witnessed the development of an intricate specialized history for the subject,[1] it is only in the very recent past that ecology has become a commonplace in serious discussions of the human condition. The population explosion, the unmanageable spread of cities, dwindling resources, pollution in all of its varieties, and the extinction of many forms of plant and animal life are different aspects of what often has been referred to as a pervasive ecological crisis. Reactions are widespread at elite levels. Over 500 bills dealing with environmental problems have been introduced into the 91st Congress. A spate of new journals have come into being within the last decade,[2] and even the popular media--television, newspapers, and magazines--have begun to devote sustained attention to the issue.[3] A major United Nations conference on the problems of the human environment is scheduled for 1972, and the International Biological Program, a global effort of basic research on the theme of man's survival in a changing world, now includes the participation of fifty-six nations in addition to the United States.

With its emphasis on interplay--on the interrelations among living things and conditions and processes--there appears to be an unlimited scope for ecology, and this has resulted in considerable confusion. Past efforts to define human ecology as a field of specific subject matter have been notably unsuccessful,

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* See Notes beginning on p.25.

and there is no single, unified body of thought to which one can refer for an authoritative briefing. The interplay between man and his environment, between the realm of nature and the realm of culture, is clearly too all-encompassing to allow easy definition. For scholars within the American Studies community, inured to the stress of an interdisciplinary frame of reference, possibly the most rewarding approach is to regard ecology as a theme that carries with it implications for many areas of inquiry.

The most important source for the theme in its modern context is found in the work of George Perkins Marsh (1801-1882), a distinguished American statesman and scholar. Marsh's public career included service as a member of Congress, Minister to Turkey, and for the last twenty years of his life, as United States Minister to Italy. His scholarly interests were of the most catholic variety, and in his own time he had a considerable reputation as an English philologist and etymologist. His claim on today's attention, however, rests with the publication in 1864 of the monumental Man and Nature; or Physical Geography as Modified by Human Action,[4] which scholars in many fields, but particularly geography, anthropology, and ecology, regard as the first great work of synthesis in the modern period to examine in detail the impact of man on his environment.[5]

Marsh's point of view was original. Rather than regarding man as a passive creature subordinate to the mysterious workings of nature, he stressed the other side of the equation, maintaining that the cumulative effect of human activities in transforming the face of the earth was a force approaching geologic proportions. His treatment was limited primarily to western Europe and the Mediterranean Basin and his purpose was "to indicate the character and, approximately, the extent of the changes produced by human action in the physical conditions of the globe we inhabit; to point out the dangers of imprudence and the necessity of caution in all operations which, on a large scale, interfere with the spontaneous arrangements of the organic or the inorganic world; (and) to suggest the possibility and the importance of the restoration of disturbed harmonies and the material improvement of waste and exhausted regions..."[6] Using a

wealth of evidence that he had drawn together from the technical writings of botanists, plant geographers, foresters, agronomists, meteorologists, and many others whose work is rarely mentioned in historical discourse, he discussed the increase in climatic contrasts resulting from deforestation, the revolution accomplished by man in plant and animal distributions throughout the world, the effects of agriculture on biotic communities, species extinction, soil erosion, unforseen changes in the regime of water supply, and a number of other topics with which we are now familiar. In the last revised edition of his work, he suggested a relationship between large urban masses and climatic conditions, an anticipation of present day studies.[7] Curiously, he paid scant attention to the problems of population and the consumption of nonrenewable resources, both of which are prominent in modern discussions.

In view of the scope of his subject, however, the sense of balance that Marsh brought to it was admirable indeed. While his research raised the possibility that "the earth is fast becoming an unfit home for its noblest inhabitant," and that "perhaps even extinction of the species"[8] was plausible, he admitted that his thesis had "no place in the general scheme of physical science, and is (a) matter of suggestion and speculation only, not of established and positive conclusion."[9] Nor did he content himself with impassioned pleas for conservation. Rather he looked forward to the gradual development of more powerful forms of knowledge and suggested, among other things, the national control of natural resources and the employment of land use plans based on the information that was then available.

Despite the fact that Man and Nature was widely discussed in both Europe and America, it is evident that the questions Marsh raised were lost in the shuffle of a vigorous, rapidly expanding civilization, understandably impressed with the accomplishments of its protean technology. Interest in his work has been rekindled in our own century as the problems he foresaw took on a more urgent character and became matters of widespread concern.[10]

Fifteen years ago a conference sponsored by the Wenner-Gren Foundation for Anthropological Research was held in Marsh's honor at Princeton, New Jersey, and the results of that meeting constitute a landmark in the history of interdisciplinary discussion. The symposium was a model of successful planning and a tribute to Dr. William Thomas, then Assistant Director of the Foundation. Three years were devoted to its preparation, the first of which was spent in researching the theme of man's impact on his environment. It was decided that the primary objective of the symposium was to be not merely the education of its participants, but the publication of the proceedings in a form that would be useful to scholars in oncoming generations. This decision required outlining not only a conference but a volume as well, which was to contain two things: a set of background papers, each stressing the contribution of a particular field of knowledge to the general theme, authored for an audience of nonspecialists by scholars prominent in their fields, and an edited version of the discussions that would take place while the symposium was in progress. The theme was divided into three sections--"Retrospect," "Process," and "Prospect"-- and three co-chairmen were appointed, each with the responsibility for one of these aspects of the symposium. The co-chairmen were Professors Carl O. Sauer, then chairman of the Department of Geography, University of California at Berkeley, Marston Bates, an ecologist, then at the University of Michigan, and Lewis Mumford.

There were seventy participants at the conference, and fifty-three of them contributed papers. The papers were circulated to members months in advance so that the meeting itself could be devoted to interchange. Participants represented twenty-four different disciplines and nine countries in addition to the United States. The resultant volume, entitled Man's Role in Changing the Face of the Earth, edited by William L. Thomas, Jr., was published in 1956 by the University of Chicago Press. Nearly 1,200 pages in length, its organization and scope of coverage render it an excellent source book for nonspecialists. The work as a whole is well illustrated and indexed, and the individual articles contain useful references.

Materials collected under the heading "Retrospect" dealt with man's tenure on the earth from pre-historic times to the present, of his rise to the status of ecological dominant, and included discussions of the antiquity and world expansion of human culture; cultural differences in the interpretation of natural resources; a survey of changing ideas of the habitable world within the western tradition; the effects of classical antiquity on the land; the role of fire as the first great force employed by man; early food producing populations; the clearing of woodlands in Europe; the ecology of peasant life in Western Europe; subsistence economies; commercial economies; the natural history of urbanization, and various related topics.

Sessions devoted to "Process" included a summary of environmental changes wrought by forces independent of man and consideration of those changes in which he is directly involved; his impact on the seas and upon coastlines; changes in the quantities and qualities of ground and surface waters; the alteration of climate in both the urban and rural contexts; slope and soil changes that result from human activity; the modification of biotic communities by fire, agriculture, grazing, the removal and introduction of species, and by other means; the ecology of wastes including problems of disposal, relations to disease, and the effects of fission material on air, soil, and living species; and lastly, urban-industrial demands on the land in terms of requirements for ores and minerals, ever-increasing amounts of space, and so on.

The third component of the symposium, entitled "Prospect," was concerned with the limits of the earth's resources, and considered the spiral of population; the possible limits of raw-material consumption; limitations to energy use; technological denudation; and man's adaptation to the earth in its bearing on his aesthetic, ethical, and legal values.

The "Marsh festival," to use Professor Sauer's phrase, was an attempt to provide an integrated basis for insights into the phenomenon of man's ecological dominance, and even the most lethargic reader of the proceedings emerges with the feeling that the processes of culture are indissolubly linked to those of the natural order, and vice versa. The history of the two converge. Given man's present capacity to effect massive environmental change, either deliberately or otherwise, it is unlikely that one can long be studied without reference to the other. Cultural adaptations vary--from primitive societies of hunter-gatherers to the extremely complex technological societies of western civilization--but the imprint of man is everywhere, from the uninhabited regions of the Arctic to the most remote stretches of the open sea.

Unfortunately, the perception that these two realms, each with a host of learned disciplines devoted to its analysis, inevitably "fit together" amounts to something less than an operative body of knowledge in its own right. When Marsh had reflected on the content of the new learning that was required, he clearly anticipated the focus of ecology, although the term itself was then unavailable. The future would require, he remarked, an understanding that embraced "not only the globe itself, but the living things which vegetate or move upon it, the varied influences they exert upon each other, the reciprocal action and reaction between them and the earth they inhabit.[11] Man's role in this grand design was obviously foremost in his mind, and to this day the relation between general ecology, with its emphasis on the structure and functioning of natural systems, and a number of other, independent fields of learning, lies at the heart of the matter.

The influence of ecological concepts on other fields of learning has been pronounced and seems to be increasing. Thus we read of the ecology of international relations,[12] the ecology of public administration,[13] the ecology of imagination,[14] and the politics of ecology.[15] If ecology then seems to flow over into all fields of learning, its basic principles and concepts become correspondingly more important, and at least a nodding acquaintance with some of its literature is essential. As in any science, its working vocabulary is rather rigid, and mixing it with the language of other disciplines can be hazardous.

From the viewpoint of ecology, life is the product of a delicate network of checks and balances which, in turn, are the products of evolution. The incredible diversity of life-forms that constitute this network is comprised functionally of producers, consumers, and decomposers, which utilize the mineral substances of often limited reservoirs of air, water, and land. The producers are the green plants, which, with the assistance of radiant energy from the sun, take up such substances as carbon dioxide, oxygen, water, nitrogen, sulfur, potassium, and phosphorus and transforms them into food. The plants, in turn, provide food for other forms of life. The consumers are the herbivores and carnivores, both types fitting into an intricate pattern of food chains and webs. The remains of both the producer and the consumers are then reduced by the decomposers-primarily bacteria and fungi-and returned to the land, water, and air.

A central concept of ecology is the ecosystem. Building upon the conventional levels of the organization of life[16] --molecules, cells, tissues, organs, organisms, populations, species, and communities-- the vast assemblages of organisms mentioned above serve as interdependent communities of life-forms. These communities, when combined with the non-living environment, constitute ecosystems, the ultimate level of biological integration.[17]

The term was first proposed by the British plant-ecologist Arthur Tansley in 1935 as a means of focusing attention on living systems in their entirety, and it has proven to be an extremely fruitful contribution.[18] Ecosystem can be used to refer concretely to a specific situation or abstractly to a class. An island, a lake, or a pond, a forest, indeed, the earth itself, each can be regarded as an ecosystem. The term's significance lies in phenomena that are unique to its level of integration--energetics, nutrient cycling, species diversity, ecological regulation, and self-perpetuation-- none of which can be understood simply by extrapolating knowledge gained from the lower levels.

Mention must also be made of self-regulation or homeostasis in ecological systems. Since both man-dominated ecosystems and those relatively free of his influence are subject to the same basic laws, such self-regulation has an important bearing on the general idea of the "balance of nature" that one so often encounters in discussion of current problems. The story is a very complicated one and systems-ecologists point out that present knowledge of the characteristics and mechanisms involved (i.e., community structure and dominance, species diversity, ecological niches, succession, energy flow and trophic structure, food webs, and biogeochemical cycles) is imperfect. The problem lies at the forefront of contemporary research, and a great deal depends on its solution--most notably the possibility of replacing our present behavior with the intelligent manipulation of ecosystems and the restoration of those now in a degraded condition.

The best known textbook on modern ecology (reportedly the one most used in college courses) is Eugene P. Odum's Fundamentals of Ecology, 2nd ed. (Philadelphia: Saunders, 1959). Another volume of Odum's, entitled Ecology (New York: Holt, Rinehart, and Winston, 1963), is very helpful because of its brevity (152 pp.) and purpose. Much more approachable than the Fundamentals, Ecology was written for a general audience and is organized around a series of pictorial or graphic models that illustrate the principles basic to an understanding of the subject. Peter Farb's Ecology (New York: Time Inc., 1963), a part of the Life Nature Library, is also effective in this connection.

The explosion of interest in the environment has presented a serious challenge to teachers of introductory biology on the college level, as they are often expected to sketch the grand design of the life sciences in terms that are meaningful to students who are working on a general liberal arts curriculum. A recent text by Robert B. Platt and George K. Reid, entitled Bioscience (New York: Reinhold Publishing, 1967), has been written with the difficulty in mind. While all due respect has been paid to the standard information on molecular and cellular biology, genetics, and evolution, the book is designed on a "levels-of-organization" framework and deals with the diversity of life, its organization into populations, communities, and ecosystems, with man as an integral part of the biosphere.

Reference must also be made to Charles Elton's classic Animal Ecology,[19] which first appeared in 1927 and earned for its author his designation as "the father of animal ecology." It remains of permanent value as a first-rate introduction to the subject, but is recommended here because of Elton's remarkable and refreshing ability as a writer. The clarity, grace, and good-humor found in this early effort are seldom encountered in later writings on ecology.

General ecology is fast becoming a prestigious discipline, quietly maturing within its own boundaries and taking on all the trappings of "big science." In the environmental planning explosion that lies ahead, however, the calm will disappear and the question of its relation to other branches of learning will become more acute. Each seems to have something to contribute. It was Elton who remarked, in discussing the disconcerting tendency of ecology to reach out in every direction, "that it might be worth while getting to know a little about geology or the movements of the moon or of a dog's tail, or the psychology of starlings, or of any of those apparently specialized and remote subjects which are always turning out to be at the basis of ecological problems encountered in the field."[20] When the field happens to be within the human sphere of influence, the need is multiplied a hundredfold.

Many disciplines have made humanizing claims upon ecology, and the following remarks are intended to introduce the reader to a few of the most obvious ones.

Geography, as protean and far-ranging a field as ecology itself, has a rich tradition that immediately comes to mind. There were more geographers in attendance at the Wenner-Gren symposium, mentioned earlier, than there were representatives from any other single discipline, and the basic paper on man as an ecological dominant was written by Carl O. Sauer. The structures of "human ecology" and "human geography" often seem to be interchangable, as witnessed by the recent publication of an anthology entitled Geography as Human Ecology: Methodology by Example.[21]

Problems of definition and method present serious obstacles. The equation of "environment" with

"climate," as in Ellsworth Huntington's Civilization and Climate (1915) and The Mainsprings of Civilization (1945), has inevitably drawn fire from both social scientists, who fret over the specter of determinism, and from natural scientists, who are uncomfortable with simplified images of the environment. The historic controversy within geography on the issue of environmental determinism versus "probabilism" is the subject of a recent article by O. H. K. Spate.[22]

The problem in anthropology is a similar one and involves the question of whether culture can be explained exclusively on its own terms or only with the inclusion of an ecological frame of reference. Archeologists and physical anthropologists have always dealt with the possible effects of the physical environment on human evolution, and all classical ethnographies include descriptions of the climate, topography, flora and fauna of the area inhabited by the society under study. These descriptions, of course, do not amount to a triumph of synthesis. For an excellent discussion of studies that shed light on the controversy, see Betty Meggers' "Environmental Limitation on the Development of Culture," American Anthropologist, 56:801-824.

The only cultural anthropologist who has written extensively in recent years on the theoretical aspects of human ecology is Julian H. Steward. In his Theory of Culture Change (Urbana: University of Illinois, 1959), he proposes that the broad areas of human ecology be broken down into three categories: human ecology itself, which would be the concern of the human biologist; social ecology, which would be the domain of the sociologist or social anthropologist; and finally, cultural ecology, which would reflect the interests of the historian of culture. Steward points out that the method and theory on which these fields are dependent are quite different. For a detailed explanation of the concepts and procedures of cultural ecology, see Steward's essay under that heading in the International Encyclopedia of the Social Sciences (vol. 4, pp.337-344). An earlier book by J. W. Bews, a British anthropologist, Human Ecology, (London: H. Milford, 1935) also provides perspective.

American sociology has had a long and tempestuous relationship with human ecology. In fact, the phrase itself is said to have its origins in that discipline. In 1924, McKenzie defined ecology as the study of the spatial and temporal relations of human beings as these were affected by the selective, distributive, and accomodative aspects of the environment.[23] In 1936, Robert Ezra Park explained that his use of the term was an attempt to operate between geography and economics and his emphasis was on the biotic or subsocial aspects of human social organization.[24] Here the term is now often referred to in connection with demography and urban geography.

The imagery of general ecology--the web of life, interdependent community, dominant species, and dynamic equilibrium--has been forced to double duty, and while the biologist may be flattered by this attention, he is likely to shudder at some of its results. Amos Hawley, probably the most prominent modern spokesman for the sociological tradition, has defined human ecology as a concern "with the general problem of organization conceived as an attribute of population--a point of view that has been shown to be consistent with a long-standing sociological tradition ...Although the emphasis is centered on the functional system that develops in a population, it is not intended to exclude concern with spatial and temporal aspects; rather, these aspects are regarded as useful dimensions for the measurement of organization."[25]

By the term "community," for example, Hawley means a segment of human society, a "population which carries on its daily life in a given system of relationships."[26] An ecologist, on the other hand, defines a community as an assemblage of many different species of plants and animals that are interdependent.

The importance of the definition problem is easily discovered by comparing Hawley's Human Ecology: A Theory of Community Structure (New York: Ronald Press, 1950) with Lee R. Dice's Man's Nature and Nature's Man: the Ecology of Human Communities (Ann Arbor: University of Michigan, 1955). Dice is an ecologist, and the similarity between the books is limited to their titles.

An interesting attempt to sort out some of the difficulties between general ecology and sociology's rendition of human ecology is the subject of a paper by Otis Dudley Duncan entitled "From Social System to Ecosystem."[27] Duncan used a set of four categories--population, organization, environment, and technology (POET.) to describe ecosystem processes, his test case being air pollution in Los Angeles, California. After reviewing the Los Angeles situation, Duncan concluded that "social change and environmental modification occurred in the closest interdependence--so close, in fact, that the two 'levels' of change were systematically interrelated. Change on either level can be comprehended only by application of a conceptual scheme at least as encompassing as that of the ecosystem."[28] Perhaps something is in the wind. A very similar paper written by a plant-ecologist, Frank E. Egler,[29] concentrates on the pesticide controversy that followed the publication of Rachel Carson's Silent Spring in 1962. Egler claims that ecology has not risen to the needs of society, and to make his case he proposes a framework very much like Duncan's, though better documented and more carefully explained.

The humanities are not well represented in modern work on man's place in nature, despite the almost inexhaustible ramifications of a theme that now pervades every aspect of human life. Here also one finds bricks and mortar--essays on the history of agriculture, detailed monographs on the conservation movement, and studies on the concept of nature in the writings of the transcendentalists, for example--but practically no architecture. One strong exception is Clarence Glacken's Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century, (Berkeley: University of California, 1967). Glacken is presently chairman of the Department of Geography at Berkeley, and he has spent most of his academic life researching the history of ideas on man and his environment. Traces on the Rhodian Shore is the fruit of that effort, and it amounts to a major piece of scholarship The volume records western man's changing response to three persistent questions. First, is the earth a purposefully made creation? Second, have its climates, its relief,

the configuration of its continents influenced the moral and social nature of individuals, and have they had an influence in moulding the character and nature of human culture? Lastly, in his long tenure of the earth, in what manner has man changed it from its hypothetical pristine condition? Restated in terms of general ideas, the focus is on the idea of a designed earth, the idea of environmental influence, and the idea of man as a geographic agent.

It is unfortunate that Glacken stopped with the close of the eighteenth century, and one hopes that he will have much to say on later developments. The task is awesome. Specialization in the study of man, specialization in the study of ecology, technical research on the capacity of man to modify nature, generally of the ad hoc, how-to-do-it variety and written for an audience of practical men--all have their roots in the nineteenth century and all continue to the present day. The need for synthesis has never been greater.

A sampling of other works coming from the humanities, although much less ambitious and comprehensive than Glacken's, should also be mentioned because of their special relation to American studies. Arthur Ekirch's Man and Nature in America (New York: Columbia University, 1963), is a brief and readable discussion of some of the main currents in American history within the context of their relation to present environmental problems.

Nature and the American: Three Centuries of Changing Attitudes (Berkeley: University of California, 1957), by Hans Huth, is a useful survey of American attitudes to nature from the Puritan period to the conservation movement. Huth is Curator of Research at the Art Institute of Chicago, an unbashed nature lover, and his study has a strong conservationist flavor. He has drawn upon a very impressive array of primary sources and the work is beautifully illustrated with sixty-four black and white plates.

Lec Marx's The Machine in the Garden: Technology and the Pastoral Ideal in America (New York: Oxford University Press, 1967), is a literary theorist's sally into the field. Marx's thought-provoking essay traces the adaptation of the pastoral ideal to the conditions of the new world, its emergence as a distinctively American theory of society, and its subsequent transformation under the impact of industrialism.

A summary for this discussion would be rather awkward, and it seems wise at this point to borrow from Paul Shepard, who once remarked, "The ecology of man has no sacred core to guard from the Philistines. It will be healthiest perhaps when running out in all directions. Its practical significance may be the preservation of the earth and all its inhabitants."[30]

* * *

NOTES

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1. W. C. Allee, Alfred Emerson, Orlando Park, Thomas Park, and Karl P. Schmidt, eds., Principles of Animal Ecology (Philadelphia: Saunders, 1949). See the introduction and chapter one, which provide a comprehensive and detailed history of the development of ecology through the early 1940s.

2. A representative sample includes Design and Environment, Environment, Environment and Behavior, Environmental Science and Technology, Environmental Education, and the Journal of Applied Ecology.

3. The New York Times and Christian Science Monitor have environmental reporters; Time and The Saturday Review have regular environmental sections; The CBS Evening News has recently added an environmental feature.

4. The most recent edition is David Lowenthal's Man and Nature (Cambridge: the Belknap Press of Harvard University Press, 1965). See also Lowenthal's biography, George Perkins Marsh: Versatile Vermonter (New York: Columbia University Press, 1958).

5. See later discussion of Wenner-Gren Conference.

6. Original edition, New York: Scribner, 1864, p. iii.

7. Marsh, The Earth as Modified by Human Action: A New Edition of "Man and Nature" (New York: Charles Scribner's Sons, 1885), p. 473.

8. Marsh, Man and Nature (1864), p. 44.

9. Ibid., p. 10.

10. For the rediscovery of Marsh, see Lewis Mumford's The Brown Decades: A Study of the Arts in America, 1865-1895 (New York: Harcourt, Brace & Co., 1931), pp. 72-78. See also David Lowenthal's "George Perkins Marsh and the American Geographical Tradition," Geographical Review XLIII (2): 207-213.

11. Marsh, Man and Nature (1864), p. 57.

12. Harold H. and Margaret Sprout, The Ecological Perspective on Human Affairs, With Special Reference to International Politics (Princeton: Princeton University Press, 1965), 236 pp. See also Man-Milieu Relationship Hypotheses in the Context of International Politics (Princeton: Center for International Studies, Princeton University Press, 1965), by the same authors.

13. Fred W. Riggs, The Ecology of Public Administration (New York: Asia Publishing House, 1962).

14. Edith Cobb, "The Ecology of Imagination in Childhood," originally published in the Summer 1959 issue of Daedalus. The paper is reprinted in Paul Shepard and Daniel McKinley's excellent anthology, The Subversive Science: Essays Toward an Ecology of Man (New York: Houghton Mifflin Co., 1969). This collection contains an introduction and 36 carefully selected essays, each of which contains references. It also includes 12 pages of suggested readings that are not referred to in the text itself.

15. Aldous Huxley, "The Politics of Ecology: The Question of Survival" (Santa Barbara: Center for the Study of Democratic Institutions, 1963). See also Huxley's "The Double Crisis" in Themes and Variations (New York; Harper, 1950), and Ernest Gruening's "The Political Ecology of Alaska," Scientific Monthly LXXIII (December, 1951): 376-386.

16. For a discussion of the levels-of-organization concept, see S. Dillon Ripley and Helmut K. Buechner, "Ecosystem Science as a Point of Synthesis," Daedalus (Fall 1967): 1192-1199; also J. S. Rowe "The Level of Integration Concept and Ecology," Ecology 42 (April 1961): 420-427.

17. For a discussion of the ecosystem concept, see F. R. Fosberg's "The Island Ecosystem," in Man's Place in the Island Ecosystem: A Symposium, ed. F. R. Fosberg (Bishop Museum Press, 1963). See also Francis C. Evans, "Ecosystem as the Basic Unit in Ecology," Science 123 (June 22, 1956): 1127-1128.

18. A. G. Tansley, "The Use and Abuse of Certain Vegetational Concepts and Terms," Ecology 16 (1935): 284-307.

19. The most recent edition (London: Science Paperbacks, Methuen & Co., 1966) contains special preface which was written by Elton in 1965. The reader is also referred to Elton's The Ecology of Invasions by Animals and Plants (New York: John Wiley & Sons, 1958). More than any single work in existence, this book establishes the scientific basis for conservation. In the last two chapters, entitled "The Reasons for Conservation" and

"The Conservation of Variety," Elton has summarized six lines of evidence supporting the thesis that stability in ecological systems is a function of species diversity. It is primarily this concept that provides ecology with the ideological status of a resistance movement, highly critical of the concepts of "progress," "development," and the assumption that a constantly expanding economy (which requires an expanding market, labor force, intensified exploitation of resources, etc.) is a measure of national health.

20. Animal Ecology, Science Paperbacks edition, p. 188.

21. Edited by S. R. Eyre and G. R. J. Jones (London: Edward Arnold Ltd., 1966). In the introduction (pp. 1-29), the editors discuss the history that led to their choice of the title.

22. O. H. K. Spate, "Environmentalism," International Encyclopedia of the Social Sciences, Vol. 4, ed. David L. Sills (New York: The Macmillan Co. and The Free Press, 1968), pp. 93-97.

23. Roderick D. McKenzie, "The Ecological Approach to the Study of the Human Community," in ed. Robert E. Park, Ernest W. Burgess, and R. D. McKenzie, The City (Chicago: University of Chicago Press), pp. 63-79.

24. "Human Ecology," American Journal of Sociology 42:1.

25. Amos H. Hawley, "Human Ecology," International Encyclopedia of the Social Sciences, Vol. 4, pp. 328-337.

26. Ibid., p. 331.

27. Sociological Inquiry 31 (Spring 1961): 140-149.

28. Ibid., p. 149.

29. "Pesticides in Our Ecosystem," American Scientist (March 1964): 110-136. Reprinted in The Subversive Science, ed Shepard & McKinley.

30. "Whatever Happened to Human Ecology?" Bioscience (December 1967), p. 894.

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THE BIOSPHERE*

By Rene Dubos

Because man is endowed with such remarkable ability to tolerate conditions profoundly different from the ones under which he evolved, the myth has grown that he can endlessly and safely transform his life and his environment by technological and social innovations; but this is not the case. On the contrary, the very fact that he readily achieves biological and socio-cultural adjustments to many different forms of stress and of undesirable conditions paradoxically spells danger for his individual welfare and for the future of the human race.

Man can achieve some form of tolerance to environmental pollution, excessive environmental stimuli, crowded and competitive social contacts, the estrangement of life from the natural biological cycles, and other consequences of life in the urban and technological world. This tolerance enables him to overcome effects that are unpleasant or traumatic when first experienced. But in many cases, it is achieved through organic and mental processes which may result in the chronic and degenerative disorders that so commonly spoil adult life and old age, even in the most prosperous countries.

Man can learn also to tolerate ugly surroundings, dirty skies, and polluted streams. He can survive even though he completely disregards the cosmic ordering of biological rhythms. He can live without the fragrance of flowers, the song of birds, the exhilaration of natural scenery and other biological stimuli of the natural world.

This loss of amenities and elimination of the stimuli under which he evolved as a biological and mental being may have no obvious detrimental effect

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* Excerpts from article in UNESCO COURIER, January 1969.

on his physical appearance or his ability to perform as part of the economic or technologic machine. But the ultimate result can be and often is an impoverishment of life, a progressive loss of the qualities that we identify with humanness and a weakening of physical and mental sanity.

Air, water, soil, fire, the rhythms of nature and the variety of living things, are of interest not only as chemical mixtures, physical forces, or biological phenomena; they are the very influences that have shaped human life and thereby created deep human needs that will not change in the foreseeable future. The pathetic weekend exodus to the country or beaches, the fireplaces in overheated city apartments, the sentimental attachment to animal pets or even to plants, testify to the persistence in man of biological and emotional hungers that developed during his evolutionary past and he cannot outgrow.

Like Anteus of the Greek legend, man loses his strength when his feet are off the ground.

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The environments men create through their wants constitute to a very large extent the formula of life they transmit to succeeding generations. Thus, in addition to affecting present-day life, the characteristics of the environment condition young people and thereby determine the future of society. It is unfortunate therefore that we know so little and make so little effort to learn how the total environment affects the physical and mental development of children, and how much of the influence persists in adult life.

There is no doubt that the latent potentialities of human beings have a better chance of being realized when the total environment is sufficiently diversified to provide a variety of stimulating experiences, especially for the young. As more persons find the opportunity to express a larger percentage of their biological endowment under diversified conditions, society becomes richer and civilizations continue to unfold.

In contrast, if the surroundings and ways of life are highly stereotyped, the only components of man's nature that can become expressed and flourish are those adapted to the narrow range of prevailing conditions.

Historically, man was very slow to expand his horizons and develop his full genetic potential. Thus, surrounding early man with nature does not seem to guarantee a rich, diverse existence. Furthermore, in some present rural areas of the developed countries, man has produced a monotony of both crops and culture that stifles human development.

The present trends of life in prosperous countries are usually assumed to represent what people want; but in reality the trends are determined by what is available for choice. What people come to want is largely determined by the choices readily available to them early in life. Many children growing up in some of the most prosperous suburbs of industrialized countries may suffer from a critical deprivation of experiences and this determines the triviality of their adult lives. In contrast, some poor areas of the world provide human environments that are so stimulating and diversified that many distinguished adults emerge from them despite the economic poverty of their early years.

There is no doubt, in any case, concerning the sterilizing atmosphere of many modern housing developments which are sanitary and efficient, but inimical to the full expression of human potentialities. All over the world, many of these developments are planned as if their only function was to provide disposable cubicles for dispensable people. Irrespective of their genetic constitution, most young people raised in such a featureless environment, and limited to a narrow range of life experiences, will suffer from a kind of deprivation that will cripple them intellectually and mentally.

In judging the human quality of an environment, it is essential to keep in mind that passive exposure to stimuli is not enough to elicit individual development. The stimulus becomes formative only

if the organism is given a chance to respond to it actively and creatively. Amusement parks and zoological gardens, richly endowed as they may be, are no substitute for situations in which the developing child can gain direct experience of the world through active participation. Juvenile delinquency is probably caused to a very large extent by the failure of the modern world to provide opportunities for the creative expression of physical and mental vigour during a human being's most active period of development.

Man has been highly successful as a biological species because he is extremely adaptable. He can hunt or farm, be a meat-eater or a vegetarian, live in the mountains or by the seashore, be a loner or a team member, function under aristocratic, democratic, or totalitarian institutions, but history shows also that societies that were once efficient, because highly specialized, rapidly collapsed when conditions changed. A highly-specialized society, like a narrow specialist, is rarely adaptable.

Cultural homogenization and social regimentation resulting from the creeping monotony of over-organized and over-technicized life, standardized patterns of education, mass communication and passive entertainment, will make it progressively more difficult to exploit fully the biological richness of the human species and may handicap the further development of civilization.

We must shun uniformity of surroundings as much as absolute conformity in behaviour and tastes. We must strive instead to create as many diversified environments as possible. Richness and diversity of physical and social environments constitutes a crucial aspect of functionalism, whether in the planning of rural and urban areas, the design of dwellings, or the management of individual life.

Diversity may result in some loss of mechanical and administrative efficiency and will certainly increase stresses, but the more important goal is to provide the many kinds of soil that will permit the germination of the seeds now dormant in man's nature.

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Until now, man has behaved as if the areas available to him were unlimited, and as if these were infinite reservoirs of air, soil, water, and other resources. He could do this with relative impunity in the past because there was always some other place where he could go, start a new life, and engage in any kind of adventure that he chose.

Since the evolutionary and historical experiences of man are woven in his mental fabric he naturally finds it difficult not to behave as a nomad and hunter. It is not natural for him to rest quietly in a corner of the earth and husband it carefully. His thoughtlessness in provoking ecological situations that are potentially dangerous originates partly from the fact that he has not yet learned to live within the constraints of his spaceship.

The ecological attitude is so unfamiliar, even to many scientists, that it is often taken to imply acceptance of a completely static system. Students of human sociology have expressed concern lest the ecologist's professional interest in the well-balanced smoothly-functioning, steady-state ecosystem of the pond be extrapolated uncritically to the whole earth and its human population. They are right in emphasizing that man's relation to his total environment cannot be regarded as a steady-state ecosystem because this would imply that the human adventure has come to an end.

The physical forces of the environment are forever changing, slowly but inexorably. Furthermore, all forms of life including human life are continuously evolving and thereby making their own contribution to environmental changes. Finally it seems to be one of man's fundamental needs to search endlessly for new environments and for new adventures. There is no possibility therefore of maintaining a status quo.

Even if we had enough learning and wisdom to achieve at any given time a harmonious state of ecological equilibrium between mankind and the other components of the spaceship Earth, it would be a dynamic equilibrium, and this would be compatible with man's continuing development.

The important question is whether the interplay between man and his natural and social surroundings will be controlled by blind forces as seems to be the case for most if not all animal species, or whether it can be guided by deliberate, rational judgements.

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On the one hand, the genetic endowment of Homo sapiens has changed only in minor details since the Stone Age, and there is no chance that it can be significantly, usefully, or safely modified in the foreseeable future. This genetic permanency defines the human race, and determines the physiological limits beyond which human life cannot be safely altered by social and technological innovations. In the final analysis, the frontiers of cultural and technological development are determined by man's own biological frontiers and therefore by the genetic constitution he acquired during the evolutionary past.

On the other hand, mankind has a large reserve of potentialities that become expressed only to the extent that circumstances are favorable. The physical surroundings condition not only the biological aspects of phenotypic expressions but also their mental aspects. Environmental planning can thus play a key role in enabling human beings to realize their potentialities. One can take it for granted that there is a better chance to convert these potentialities into actual realizations when the physical environment is sufficiently diversified to provide a variety of stimulating experiences and opportunities, especially for the young.

Any change in mental attitude and in ways of life becomes incorporated in the human group concerned through socio-cultural mechanisms, and from then on it conditions the future development of the group. Socio-cultural evolution is as much under the influence of the environment as is biological evolution, and almost as irreversible.

Planning for the future demands an ecological attitude based on the assumption that man will continuously bring about evolutionary changes through his creative potentialities. The constant interaction between man and environment inevitably implies continuous alterations of both--alterations that should always remain within the constraints imposed by the laws of Nature and by the unchangeable biological and mental characteristics of man's nature.

SURVIVAL OF PLANTS AND MAN *

By Lewis Mumford

In my recent book, The Myth of the Machine, I pointed out that the great advances in neolithic domestication were made with hardly any mechanical aids. One of man's instruments, fire, had been in his hands for some 500 thousand years. The other was the stone ax, with which man could chop down trees. Those who equate neolithic plant domestication with grain cultivation and plow culture have not caught up with recent archaeology; for though these last inventions were extremely important, the major advances of the neolithic revolution had been made long before through a fuller understanding of plant nurture, plant selection, plant hybridization, in the timing of cultivation to fit the seasons, and in the close watching of the relation of plant growth to soil, water, ash, and dung.

With the aid of the ax, neolithic man opened up clearings in the forests of the highlands where the plants he chose would have sufficient space, moisture, nutriment, and freedom from competition to thrive, while on the edge of the clearings in the same area the berry bushes took hold and spread about further through the cooperation of the greedy finches and cardinals. This picture of the beginnings of neolithic domestication-though of course partly hypothetic-corresponds to the growing archaeological evidence, and emphasizes something that needs emphasis, namely, that though grain cultivation capped this process, what was even more important for human development was the combination of plant variety, continuity of

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* These excerpts from Dr. Mumford's contribution to CHALLENGE FOR SURVIVAL, edited by Pierre Dansereau, are reprinted with permission of the publisher, Columbia University Press, NYC., Copyright 1970.

occupation, and the growing interdependence of man, plants, insects, and birds. Up to this point man's greatest improvements had been made with the materials of his own body: the symbols of dream, ritual, language and art. Now he was at least sufficiently well established to enter into an active partnership with plants, and later with the animals that paleolithic hunters had venerated. With plant domestication, man's inner life and his outer life achieved a balance.

This active partnership between man and plants did something more than ensure their common survival: it provided, as never before, the conditions for their further development. Every domesticated plant and animal we use today, with a few trifling exceptions like the boysenberry and the coffee plant, was originally a product of neolithic domestication, whose clearings and tilled acres and vineyards and orchards finally engirdled the Earth. Though the period of botanical and agricultural experiment came to a climax before the Bronze Age, this culture has a record of longevity and continuity that indicates how admirably it met the conditions necessary for both ecological balance and human development in every kind of geographic environment. The local center of this culture was the successor of the neolithic village, where the traditional rites, the traditional customs, the traditional lore of cultivation, were passed on from generation to generation, from century to century: slowly absorbing the improvements introduced by the higher cultures, being guided by the new astronomical calendar, making use of the horse and the ox and the plow, gratefully accepting the iron hoe and the iron spade, yet always stable enough to pass on the essential knowledge of plant needs and cultivation processes and human purposes to ensure the village's survival. If survival were to be our only criterion of fitness, this basic neolithic culture would hold the record. That village economy spread over the entire planet and it left everywhere the imprint of its essential features: variety, balance, controlled and limited growth. Until the present generation, four-fifths of the human race, according to the French geographer Max Sorre, lived in villages that were closer in every aspect to the neolithic community than to any

contemporary metropolitan complex. If this culture never reached the constructive heights of the urban civilization of the Bronze, the Iron, or the Nuclear Age, it never descended to their depths of destruction and extermination.

Both plants and men-even when due allowance is made for overbrowsed forests and overgrazed pastures and eroded hillsides-were safe in the hands of such backward communities: their very feebleness and lethargy were an insurance against gross human mismanagement. But all this has changed, almost within our own generation; and the ancient symbiotic relation so helpful to both human and plant life, may be dissolved in an excess of technological dynamism within our life-time.

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Isn't it time for us to ask ourselves a few serious questions about the overheated technology upon which we have become so dependent, and the expanding economy that we have been so sedulously promoting and coddling, at the expense of organic balance and development, to say nothing of human health, poise, sanity? We are no longer in control of this overpowered and overpowering corporate mechanism: we are driving this supposedly up-to-date vehicle without either a steering wheel or a brake, and our only form of control is through the use of an accelerator to make it go faster, even though that greatly increases the danger.

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If we are to recover both our ecological and our cultural balance, we must subject our entire economy to a rigorous examination, and deal with our difficulties at their source, instead of paying attention to them only when they have become so embedded in the whole structure of production and consumption that they cannot be removed except with heroic exertions and at extravagant cost. In other words, instead of becoming heartsick over our littered roadsides, our rubbish dumps, our auto cemeteries, we must challenge the whole economy of the disposable container. Instead of just fighting against turning our last wetlands

into jet ports, we must challenge the notion that all other human needs should be sacrificed to fast transportation. In short, we must dare to question the religion of the machine, and be ready to flout the superstitious observances and taboos that have been erected to ensure the supremacy of automation, computerism, and electronic communication over more important services to human life that the wilderness areas, the cultivated farmland and parkland, vineyards, and orchards produce.

If we intend to provide for the survival of plants and men, we had better become iconoclasts of this machine-centered religion: we must throw down these idols, and ask the bat-eyed priests of technology what on earth they think they are doing. Obviously, the Earth, in all its variety and complexity of environments, is the last place for which they feel any sense of responsibility: they are off on dizzy trips to outer space--"trips" in <u>both</u> present senses of the word...

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Instead of defending our position, putting up a dreary rearguard fight against the armies that are conquering the Earth for the sake of unlimited power and profit and prestige, the time has come for man and his plants to join forces in a counter-attack. Mere survival is not good enough: we must devise a strategy to ensure the further development of plants and men. The odds against our success are far from hopeless, for in fact, all life is on our side--and has been since the very beginning, slow though we have been to realize this fact. Here I return to my original theme: we have something to learn from the plants. The flowering plants, above all, have much to teach us about our own nature. Not by accident, the young, who are in revolt against our power-stricken and machine-regimented society, have seized upon the symbolism of the flower, and call themselves "flower children." In a very innocent, simpleminded, sometimes downright silly way, they have used the flower symbol to express their rejection of this automated and computerized and life-hostile technology. We, too, must learn to be flower children again, and

rejoin the old procession and pageant of life.

Yes: the plants, above all the flowering plants, have something to teach us. Remember Loren Eiseley's beautiful chapter in The Immense Journey, about that turning point in organic development when the Age of Reptiles gave way to the Age of Mammals, those warm-blooded beasts that suckled their young. Eiseley pointed out that the Age of Mammals was accompanied by an explosion of flowers; and that the reproductive system of the angiosperms was responsible, not merely for covering the whole earth with a green carpet composed of many different species of grass--over four thousand--but for intensifying vital activity of every kind, since the nectars and pollens and seeds and fruits and the succulent leaves dilated the senses, exhilarated the mind, and immensely increased the total food supply. Not merely was this explosion of flowers a cunning device of reproduction, but the flowers themselves assumed a variety of forms and colors that in most cases cannot possibly be accounted for as having survival value in the struggle for existence. It may add to the attraction of a lily's sexuality to have all of its sexual organs displayed amid teasingly open petals; but the huge success of so many Compositae, with their insignificant florets, shows that biological prosperity might have been purchased without any such floral richness and inventiveness.

Efflorescence is an example of nature's untrammeled creativity and the fact that floral beauty cannot be explained or justified or purely utilitariangrounds is precisely what makes this explosion so wonderful--and so typical of all life processes. Biological creativity exists for its own sake: if survival were all that mattered, life might have remained in the primal ooze, or crept no further upward than the lichens. The capacity for self-transformation has not yet been expressed in any currently accepted biological doctrine, nor yet is it explained by the chemical instrumentality of DNA. But long before man himself became conscious of beauty, beauty existed in the endlessly

varied forms and colors of the flowering plants. The selection and encouragement of these plants, quite apart from any utilitarian value, was what gave man his first real glimpse, perhaps, of paradise--for paradise is only the original Persian name for a walled garden. The capacity for exuberant expression symbolized by efflorescence--this is the primal gift of life; and to consciously maintain it and guard it and expand it is one of the ultimate reasons for human existence. There are no mechanical or electronic substitutes for this kind of creativity.

But observe: our present-day civilization, in allowing its neolithic foundations to crumble, now finds itself in a curious position. Thanks to man's superb intelligence and his ability to translate mathematical and physical abstractions into practical inventions, the gift of exuberance has been transferred from the world of living organisms to the world of machines, electronic apparatus, and power utilities. Here we are deliberately displacing organic variety and replacing it with a more limited mechanical variety.

THE ECOLOGICAL POINT OF VIEW*

By Roland C. Clement, Vice President of
the National Audubon Society

If the Age of Aquarius is to be succeeded by the Age of Ecology, we need to ask what Ecology means.

It is not, for example, a substantive term. We must stop complaining that someone is changing the ecology" of an area, or that some practice is "poor ecology". It is ecological relationships that are changed--and these are changing all the time, with or without people. Our problem is to discover which trends are desirable, and to foster these rather than destructive changes wherever possible. Poor ecology is simply sloppy investigation of these trends. The dictionary is no help here because it condones poor usage of the word.

Ecology, properly understood, has three implications for us because the meaning of a word is never simple. Every word is a symbol and we must beware of confusing ourselves by overlooking or misapplying its meanings.

Ecology is first of all a scientific term, a label for the study of the interactions between living things and their environment. At first it was applied only to the interrelationships of plants and their physical environment--soil and moisture. Animal ecology developed next, and only recently was it broadened to the ecology of plant-animal communities. These early limitations were of course a result of specialization in biology, so that men were either botanists or zoologists rather than naturalists. In one sense, then, today's ecologist is a modern, scientific naturalist who tries to study all the interactions of at least part of a local environment. Nature is so

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* A talk before the Junior League of Hartford (Conn.) Ecology Workshop, November 17, 1970.

complex, however, that even the most capable ecologist can study only aspects of the total reality. In short, ecology is the study of ecosystems, ultimately of the whole biosphere, which is that thin layer of our planet where alone life--that most complex and exciting of all interactions--exists. In this modern, scientific sense of the word, there are still very few ecologists.

Because ecology is now an "in" word, however, many people call themselves ecologists, or are called ecologists by their organization in order to bolster the organization's image. I am one of the latter. I have never done truly ecological research and am therefore not an ecologist in the professional sense. I have developed an ecological point of view, however, and may, if you are generous, be called an ecologically-oriented conservationist. That is, I study what research ecologists publish in scientific journals, consult with them, and attempt to analyze conservation problems from the ecological point of view, i.e., in a holistic way. This ecological point of view needs to become the reorientation of science in every general education process, and it is one you must try to develop for yourself if you wish to make intelligent judgments about your relationship to the planet.

There is a third implication of the word ecology, however, and for the long run it may turn out to be its most important meaning, although I have so far hardly heard it hinted at. I now refer to the basis ecology furnishes for a new religious attitude in our day.

The scientific method is our best means of discovering meaning in the reality of the universe which surrounds us, and of which we are a part. It is a powerful, precious tool for creatively adapting ourselves to our planet while adding to both our comfort and our safety. But it is only a tool, even as ecology, which is integrative science. Technology is science applied to economic objectives. It is a specialist's approach. The ecological point of view is the intelligent layman's use of science. It is a generalist's approach.

The point of view, or attitude, does not advance science, but it tries to benefit from the insights of science by using these as guidelines to action. Finally, the commitment that causes someone to accept and apply the restraints imposed by scientific knowledge is a religious attitude.

It probably needs restating that religion is simply that element in our character that causes us to take life seriously, to be concerned about our destiny, and to strive to develop a responsible world view based on the faith that the life process--of which we are currently the apogee--has potentialities it is our destiny and our duty to strive to discover and realize, even though our experience attests to the fact that we shall never achieve more than a commitment to, and perhaps some movement in, a higher direction. We have mistakenly taken the churches and their tenets as though they were religion itself. But the churches have only institutionalized particular world views and ideals, and all of them imperfectly; and all of them tend to founder at some time or other because institutionalized religions are not inclusive enough, nor flexible enough, to survive the changing circumstances of evoluntionary history.

I suspect that it is this unlabeled religious nature of ecology that has intuitively attracted the enthusiastic attention of so many young people. They seldom have enough historical insight to realize this--since they have not yet participated in the historical process long enough and because they are being buffeted more harshly by the social disorganization of our times--but my proposition seems worth testing. People, especially young people, need holistic symbols--something that expresses a reality greater than themselves, a meaning to life that will survive them, and which is thus worthy of their allegiance. The tribe, the Nation, and God have been such symbols. But symbols are given meaning by the circumstances of history for particular people in particular places at given times. Time and new circumstances distort the meaning particular symbols originally carried. Their revelatory power is lost, and their

original meaning, if still valid, has to be rediscovered and reinterpreted. This is why, I believe, Martin Buber spoke of the "eclipse of God". And this is why, I think, ecology may have great implications for a reawakening to the unity of Man and Nature and other basic realities. It provides a new meeting ground between science, which we need to maintain ourselves as a species and to identify ecological limits; and the religious humility we must have if we are to use our scientific technology creatively rather than destructively.

If you agree that this orientation has some validity, use it to test everything that is said to you or that you propose to say to others. The criteria can be simply stated: Whatever truly advances life is probably ecologically sound, and vice versa. Putting this code into practice is of course always subject to error. We never know, certainly, what will advance life. Every decision involves the risk that we have misjudged the circumstances and the implications of our actions. In the sphere of interpersonal relations, we must act because even withholding a decision is an action; our only protection is love. But in the environmental field, where the natural processes are time-tested, we should withhold decisions to alter things until we have consensus. Ecological orientation, in short, would deny blind faith to the "technological fix", but have the courage to hazard technological change when science seems to justify it. There will always be risks; the challenge in taking what technologists call "calculated risks" is to calculate them in favor of life, not the profits of some corporation.

Finally, the ecological criterion, when applied to the human population problem, suggests that the mere nurturing of numbers is the gravest blunder of all because it diminishes the quality of life. We know, for example, that overcrowding will destroy the mores of any animal community. Ecologists have recognized a relationship in nature they call "competitive exclusion": it is simply that no two species can long occupy the same

territory without one of them displacing the other. We see this when a new species is introduced, willfully or accidentally, into a new continent. The starling, introduced to North America, has expanded its numbers from coast to coast at the expense of our small woodpeckers, bluebirds, and purple martins. Man himself has of course pushed several hundred other species from the planet, mostly through heedlessness, but also because, for a long time, man was a direct competitor of the large carnivores. This competition is no longer a hazard to man and we are challenged to limit our exploitation of the planet so as to leave room for other forms of life.

However, the principle of competitive exclusion reaches its worst expression in the competition which pits man against man in modern society. We have created a new type of poverty and overextended ourselves dangerously. Before our technological way of life deluded us into believing that we had really improved the lot of mankind because we were eliminating much early mortality and satisfying the animal needs of certain majorities, almost everyone was poor. In most places in the world, Nature is niggardly and people are necessarily poor because they exceed the carrying capacity of their environment. But when everyone is poor man attains a certain dignity by struggling against the limits of Nature. When society, in becoming technological, divorces man from Nature, however, men are pitted against one another. Disparities between men then become magnified, and poverty becomes a positive evil because it makes self-confirmation more difficult and erodes human dignity. This is the basis of the new racial conflicts that are flaming up within our own country and around the world. The competitive pressures of western, technological man are subtle, involving cultural and economic exclusionism, rather than outright physical replacement, but they still constitute competitive exclusion in a biological sense. People who never heard of the principle recognize its operations and resent it.

So long as economic growth was the dominant characteristic of our western way, people at home and abroad suppressed their disquietude about its cultural implications because they kept hoping that their poverty, too would be eliminated. But now that we are approaching saturation, and we have failed to eliminate poverty after several generations ofso-called Progress, the much augmented majority--which is still poor--has lost faith in progress and is rebelling.

For two hundred years we have promised to eliminate poverty from the top down, by making the rich richer. We have failed, and it is time we tried a more promising approach. We must, somehow, turn industrial production to the service of man instead of producing for the convenience of the corporation and its managers. And we must stop population growth. These two solutions are interdependent. We cannot stop population growth until we have made the lives of the poor much more secure in a material way; and we cannot turn our productive skills to the elimination of poverty until we have slowed population growth enough to buy the time necessary to educate people, modify our economic system, and reorder our lives.

If we do not do these things soon, population growth, the disaffection of the majority of mankind, and the need to maintain order will force a complete collectivization of life, and an end to the ideal of a democratic society of free individuals. The American experiment will have failed because it was not considerate enough of life.

THE LACK OF REVERENCE FOR NATURE*

By Coleman McCarthy

Politicians and businessmen, often the last to prevent a disaster but the first to squirm when it comes, are predictably raising their voices and their dollars on the crisis of pollution control. That many use the word "control" is itself a hearty mock of nature, as if nothing is wrong with polluing the air, land and water, so long as we control it. Hardly a syllable is uttered about elimination, perhaps in stiff fear that if America eliminates pollution who knows what else might go--perhaps the happy twosome of progress and profits.

Thomas Merton, the late Trappist priest who spent 25 years in the Kentucky hills seeking union with God and harmony with Nature, wrote shortly before his death a moving essay on the environment called "The Wild Places." Merton believed that the "tragedy revealed in the ecological shambles created by business and war is a tragedy of ambivalance, aggression and fear cloaked in virtuous ideas and justified by pseudo-Christian cliches... An examination of our social, economic and political history in the last hundred years would be a moral nightmare, redeemed only by a few gestures of good will on the part of those who obscurely realize that there is a problem. Yet compared to the magnitude of the problem, their efforts are at best pitiful; and what is more, the same gestures are made with great earnestness by the very people who continue to ravage, destroy and pollute the country. They honor the wilderness myth while they proceed to destroy nature."

In peeling the pollution onion to its eye, it is not really enough that we are going to spend billions on anti-pollution programs, or that polluters are being hauled into court, or that

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* Reprinted with permission from the Washington Post, where it appeared on the editorial page, February 18, 1970.

Mr. Nixon is sponsoring road shows to express his alarm. The one thing needed to recover and preserve the American environment is exactly the one thing money, programs, and Presidents cannot instantly effect among the people: a reverence for the earth. This reverence, in its simplest form, means paying fair homage to the soil, the winds, the waters and honoring the very spirit of their places. In the balance of ecology, wrote American naturalist Aldo Leopold, "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise."

One reason the American environment is now a septic tank is that we have never considered ourselves in union with the biotic community. Arrogantly, we have chosen not to be a partner but a master, always goaded to greater horrors by one ethic; what good is Nature if it can't be transformed into wealth? Many believe that our ecologic depravity comes from the Bible--an overemphasis of the notion in the first chapter of Genesis that man was meant by God to have dominion over all living things. When the Puritans, with their love of literality, came to the North American continent, they took it as their Christian duty to fight and tame the wilderness. That was "God's work." The Bible and ax-carrying pioneers followed, and the nation needed only 200 years combat duty with Nature to subdue it with asphalt, chemicals and atmospheric mud.

Part of the taming of the wilderness was a legitimate struggle for existence; the trouble came when the early American tiller of the soil and feller of trees saw nothing wrong with taking a little extra food from Nature; just to make the next struggle easier. This was labelled progress, and if anyone argued, he could be refuted by Genesis I and the growing GNP: the Almighty God and almighty dollar.

Since the time when the first trees were needlessly cut by an early American settler, the overkill mentality has prevailed. It became a habit of mind, a destructive urge so deeply

subconscious that even now the politicians and businessmen are easily conning the public that the environment can be saved with just money, programs and patience. Few dare say that pollution is in our national blood, a part of our mood and a basic to our economy, and until we get it out of all three--completely out--our country is doomed. Doomism is not popular among a people who have convinced themselves they can do anything; but eventually the unrevered earth will begin returning to us exactly what we have been giving to it: cruelty and poison.

Assuming for a moment, a wild one, that this country could miraculously regain its senses, what would reverence for the earth involve? A recent talk by Dr. Rene Dubos at the Smithsonian Institution supplies an important part of the answer. Insisting that Nature can be used, without being exploited, by means of "creative intervention," Dubos cited practices of the 12th century brothers and priests of the Cistercian order. With only their muscles and reverence for their land, they used ecological concepts which are as relevant to modern times as the latest ideas of a Fuller or a Doxiades.

"The Cistercians," said Dubos, established their monasteries in the lowlands and swamps; consequently, they had to learn to drain the land, and therefore they learned to use water power. And, through these technological practices, they converted areas of swamps and forests--that were not habitable because of the prevalence of malaria--into wonderful fertile land which now makes up much of Europe's countryside.

"The achievements of the Cistercians serves to illustrate another aspect of modern ecologic philosophy....the swamps in which they established their monasteries were built for human life because of insects and malaria. But monastic labor, skill and intelligence converted these dismal swamps into productive agricultural areas, many of which have become centers for civilization. They demonstrate that transforming of the land,

when intelligently carried out, is not destructive but, instead can be a creative art."

As an example of modern creative intervention --there are a few, incredibly--Dubos praised the stretch of the Taconic State Parkway above New York City. "This is a product of technology which has transformed nature while still respecting her character. I think the Taconic Parkway is a kind of creation which in some ways is the equivalent of the medieval cathedrals."

Another important statement on reverence for the earth is the book, "Design With Nature," by Ian McHarg (Natural History Press, Garden City, New York), McHarg, a landscape architect, goes beyond melancholy and dismay over the anti-nature crimes.

In great, but readable, detail, McHarg outlines ecological plans for the Potomac River Basin, the Green Spring and Worthington Valleys above Baltimore, Staten Island, the New Jersey shore and the Philadelphia airshed.

Man is only a recent visitor to the planet earth. Compared to the billions of years that the primordial forces worked in silence in the vast canyons of cosmic space, he has been here only an infinitestimal moment. The prospect that he will pollute his species back to oblivion is a huge tragedy, but perhaps it is only part of a cycle, a ripple in the contour of evolution, part of the pilgimage of living things that began with cells and plants and only lately has included man.

The philosopher Whitehead saw the earth as a "second-rate planet revolving around a second-rate sun." Despite this, the earth has been a gracious host for the few moments its most recent visitor--man--has been here. But has never guaranteed this species a permanent place; and because man is doing what no other species has ever done--quarreling with Nature--it appears that his presence on earth will be nothing more than a brief guest appearance.

A NEW SENSE OF HUSBANDRY*

By Clay Schoenfeld, Joint Professor of
Journalism and Wildlife Ecology,
University of Wisconsin-Madison

To do something about environmental conservation, redevelopment, and maintenance requires a sense of husbandry, a sense of responsibility on the part of every American citizen--that man-land ethic or "ecological conscience" which Aldo Leopold bespoke. It is unthinking people who pollute the environment" it is thinking people who can effect a "new conservation."

We are talking, then, about environmental education: "a recognition by man of his interdependence with his environment and all of life, and his responsibility for developing a culture which maintains that relationship through policies and practices necessary to secure the future of an environment fit for life and fit for living."

Many ask, what is the difference, if any, between the new "environmental education" and the older "conservation education?" The newer term attempts to do a more precise and at the same time a more comprehensive job of describing our ecological efforts to come to grips with the degradation of man's interlaced surroundings.

In terms of its scope, the new environmentalism attempts to be all-encompassing. Whereas yesterday we tended to treat soil conservation, water conservation, forest conservation, wildlife conservation, and so on as separate units, today we try to understand and explain the ecological unity of all man-land relationships. In terms of its focus, then, the new environmentalism is man-centered. That is,

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* From testimony before the House Select Subcommittee on Education hearings on environmental education, March 27, 1970.

our primary concern has shifted from the survival of remnant redwoods and reptors to the survival of nothing less than the human species itself. At the same time we are not so much concern about quantities of natural resources as we are about the quality of the human experience.

In terms of its focus, while the old conservation conjured up images of open country, the environmentalism incorporates the pressing problems of the city. In terms of its emotional underpinnings, the new environmentalism is based more on fear for man's tomorrow than on a love for nature's yesterday. Thus today's "preservationist" is not a lover of wilderness; he is one who fears the four horsemen of "conquest, slaughter, famine, and death," In terms of its political alliances, the old conservation was linked to such orthodox causes as depression pump-priming, national defense, and outdoor recreation; the new environmentalism, on the other hand, encompasses the hitherto unmentionable demands of the neo-Maltusians for population control.

It is in its basis cultural orientation, however, that the new environmentalism differs most strikingly from its antecedent, conservation. The latter, in the words of one patron saint, stood clearly for economic development, for the infinite goodness of American "progress," But environmentalism reflects a growing suspicion that bigger is not necessarily better, slower can be faster, and less can be more.

If anything surely marks this revolutionary nature of both the rise and rationale of the new environmentalism, it would be the recent words of a Republican President of the United States, telling us that "wealth and happiness are not the same thing," that now is the time to "make our peace with nature," and that we must "measure success or failure by new criteria."

Hence the search for a planning strategy for the new environmental education in America. If a national effort in environmental education is to be strengthened, we must (1) identify the audiences, (2) suggest methods, (3) outline an organization,

and (4) propose a timetable. In terms of a timetable, I propose that we proceed simultaneously on a variety of fronts. In terms of an organization. I propose that we build "critical masses" of environmental education at the federal, state, and local levels. In terms of methods, I propose that we start with what we have and invest heavily in research that will reveal optimum tactics. In terms of audiences, I suggest three: elementary and secondary school pupils and their teachers, college and university students and their professors, and adults in their roles as leaders of community action and as citizens in general.

Particularly, we need to establish on appropriate university campuses Environmental Education Centers that will focus on the problem of translating resource management policies and plans into action on the landscape through (a) the collation of information about, and the preparation of practical materials on, restoring the quality of the environment, (b) informal instruction and technical assistance carried out directly to local governments, regional instrumentalities, and citizen groups, (c) the refresher education of key practitioners brought back to the campus for work in natural resources policy implementation, and (d) research in adult education theory and practice. Growing national programs of environmental management depend increasingly on state and local initiative and responsibility. "The problem of the states" as Life Magazine said in its editorial of Nov. 4, 1966, "is not lack of power or opportunity or even solely of money; it is a shortage of competent public servants." The proposed Environmental Education Centers would tackle the problem directly by up-grading such key community leaders as planners, lawyers, resource specialists, adult educators, communicators, teachers, and public administrators, and by reinforcing them with improved educational materials and professional consultation. The Centers would also be concerned with adult education and communications research.

Why do we continue to have serious trouble translating federal intentions and state plans into timely, sound action on the land? One answer would certainly seem to be it is only at the local and regional level that public policies can be translated into public and private practices, and it is here at the intra-state level where the forces of wise resource management continue to be ill-equipped to deal with the forces of exploitation. The inefficiency with which public agencies and private citizens go about performing the socially essential tasks of environmental housekeeping stem largely from the fact that the technical and organizational skills available to the land conserver or rational planner are normally inferior to those available to the land exploiter.

While we do not of course yet understand all the scientific facts and societal values attendant to enviornmental quality control, what we do know is not being applied on a scale commensurate with the present pace of environmental pollution. At the local and regional level, where most of the decisions affecting the quality of the environment are made, we must address ourselves firmly to laying a basis for action by elucidating the choices in land and water use, relating them to general values and social objectives, instilling in people a desire for constructive change, and providing practical guidelines that encompass integrated rather than unilateral approaches.

The urgency of need will not be met through educational processes of normal pace and dispersion. What is needed now, and for some time to come, is a steady stream of specific skills and resources rifled to the local and regional firing line. We need local leaders equipped with an understanding of the interrelationships involved between their callings and total environmental management, and with a knowledge of the "tools of the trade" in energizing land and water use controls.

To begin to develop and equip a cadre of local resource management leaders it will be helpful to concentrate on those individuals at the local and regional level who typically do or can play the role of "change agents" in conservation. Four such categories of key personnel can be identified: (a) lawyers, (b) planners and administrators, (c) field resource technicians, and (d) communicators and educators.

To retrain all such change agents and to equip them and their clientele with effective education-for-action materials and services will be a role of the Environmental Education Centers. The Centers will also perform related research focussed on improving their concepts and techniques. Initially an Environmental Education Center would assemble from the university and elsewhere as necessary a staff representing overall competence in environmental problems, to include people trained in biology, design, soils, economics, geology, engineering, ecology, sociology, public administration, journalism, education, law, and other environmental disciplines applicable to land-use issues. Their extension function would be the collection and collation of what is known, what has been done, what is being done, and what might be done; the preparation of educational materials, utilizing a variety of media; and the dissemination of information and technical counsel to local governments and citizen groups through institutes, audio and visual media, and consultation. The team would be encouraged to work with maximum speed and practicality, yet with intellectual breadth so that the environmental caretakers on the receiving and develop a sound view of the inter-relatedness of decisions affecting the environment and of the immense complexity of human needs that must be reconciled and met.

At the same time, the Center would provide fellowships for practicing change agents to come to the campus for a year of study focussed on the practical problems faced by those trying to plan, acquire, maintain, and manage lands and waters for public purpose. These professionals would take regular courses and special interdisciplinary seminars, and will also perform research duties in the Center. Appropriate degrees could be awarded to qualified personnel.

In addition to such regional Environmental Education Program which will make organizational and fiscal provisions for the following main thrusts:

1. At the Presidential level, a National Commission on Environmental Education, charged principally with developing integrated concepts, methodologies, and materials.

2. At the Cabinet level, an integrated National Environmental Education Center, lodged in the U.S. Office of Education but drawing support from all appropriate agencies.

3. At the State level, Environmental Education Coordinators in each Chief State School Officer headquarters.

4. At the local level, coordinators, curricula, committees, and sites to translate the national effort into action in the school and on the landscape.

It is essential that the Program be multidisciplinary in its posture and multi-process in its programs; unilateral approaches to environmental management have caused many of our present problems. What might be meant by multi-process? A program concerned with the production of new knowledge and new knowledge-seekers of more and better resource managers, of citizenship education, and of technical counseling and services. What do we mean by multidisciplinary? We mean we are concerned with the total environment of man: its social, cultural, economic, and esthetic, as well as its physical and biological, aspects. To seek environmental quality requires both an understanding of human needs and the needs of a healthy natural environment. The development and management of environmental quality requires contributions by all the arts, sciences and professions. The end is to bring conflicting forces into functional relationships in an order in which human impact does not needlessly destroy environmental quality and where environmental quality contributes to more fruitful human life, liberty, and the pursuit of happiness. While we recognize the essential importance of strengthening existing desciplines, the essential nature of environmental education looks toward research teaching, and extension configurations that transcend traditional lines of endeavor and are concerned with the wholeness of the relationship between man and his surroundings.

The rationale for a National Environmental Education Program is simple: it is unthinking people who pollute the environment, and it is thinking people who can bring about environmental conservation, redevelopment, and maintenance. The spirit of the decade is a spirited search for environmental quality. To support and sustain this third American revolution will require an educational program as massive as the problem of human survival.

SOCIAL INTERACTION*

By Michael Scriven, Department of Philosophy
University of California, Berkeley

May I conclude by drawing the anology between political and environmental education a little closer. If you define an ecosystem rather widely, with respect to man and his effects upon his eviron-ment, you find yourself automatically involved in the discussion of politics and ethics. For politics and ethics are nothing more than systematic attempts to provide solutions for the problem of social interaction, i.e. the interaction of humans with their human environment. There will be little satisfac-tion in environmental education that teaches us how to handle our natural environment if it does not recognize the fact that part of that natural environ-ment is ourselves. There is no natural and no logical way to draw the boundary between the unthinking and the thinking part of man's environ-ment. We may, for practical purposes decide to divide our efforts in this matter. But we must recognize that in the long run our drive to achieve environment education is part of the drive to achieve adequate education for social interaction.

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*From the "Background Book", 13th National Conference of the U.S. National Commission for UNESCO, San Francisco, November 23-25, 1969.

AN ENVIRONMENTAL ETHIC*

By Ron Eber, Co-Chairman, Student's Environmental Confederation of California

Since year after year, our ecological problems are compounded, what Aldo Leopold states in his book, A Sand County Almanac, about the present state of environmental education is most relevant:

> Is something lacking in the content, as well? It is difficult to give a fair summary of its content in brief form, but, as I understand it, the content is substantially this: obey the law, vote right, join some organizations and practice what conservation is profitable on your own land. The government will do the rest.
>
> Is not this formula too easy to accomplish anything worthwhile? It defines no right or wrong, assigns no obligation, calls for no sacrifice, implies no change in the current philosophy of values. In respect of land-use, it urges only enlightened self-interest. Just how far will such education take us?

My special concern is with Mr. Leopold's reference to a "change in the current philosophy of values." The following are my reasons.

Man is probably locked in a life or death struggle for survival. He is combatting a monumental environmental backlash of pollution and contamination which may well be overwhelming. However, man's attempts at combatting these problems based upon technological solutions and the old

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* From testimony before the House Select Sub-Committee on Education hearing on environmental education, May 1, 1970.

assumptions that caused the problems in the first place, although necessary for immediate health and safety, can only be a temporary delaying action. To secure long-term solution, man must deal with the cause of his problems. This cause is the lack of a broadly accepted environmental ethic dealing with how man perceives his role within the natural scheme of life.

How man perceives his role in the environment is then the root of our problems or the cause.

As man becomes aware of a perplexing question or problem in regards to his niche in the environment, either by revelation or education, he will seek an answer and, thus, make an evaluation. After an evaluation is reached, some course of action or response to the problem will ensue. It is these responses and actions that have caused our present environmental problems. If the revelation or education that I mentioned is changed, then man's actions also will hopefully change.

We cannot simply deal with the problems but must stimulate another evaluation based on sounder facts or a new ethic, free from technological myths, from theological prejudice and anthropocentric ideals. Biologist Garret Hardin, in "The Tragedy of the Commons," states that the "problem has no technical solution. It requires a fundamental extension in morality." Changes in morality connect the problems and causes with theology and philosophy.

Also Leopold eloquently explains ecological philosophy by bringing together ethics and ecology. "This extension of ethics, so far studied only by philosophers, is actually a process in ecological evolution. Its sequences may be described in ecological as well as in philosophical terms."

What are these ecological terms and what is ecology? Ecology as the core of environmental education, is more than a system of nature. It is also one of human relationships. The ecology movement and environmental education must seek to do more than clean up rivers and the air or stop the use of pesticides. They must seek to stop all

practices that degrade or destroy life and environments on the planet.

But what are the terms of ecologically relevant education? Paul Shepard, in his introduction to the book, "The Subversive Science, Essays Toward the Ecology of Man," states:

> Ecology deals with organisms in an environment and with the processes that link organism and place. But ecology as such cannot be studied. Only organisms, earth, air and sea can be studied. It is not a discipline. There is no body of thought and technique which frame an ecology of man. It must be, therefore, a scope or a way of seeing. Such a perspective on the human situation is very old and has been part of philosophy and art for thousands of years. It badly needs attention and revival.

In our colleges, we must get away from specialized education when dealing with environmental problems. Biology shows us that all life is interdependent. Therefore, the perspective or outlook that Shepard speaks of can best be achieved by interdisciplinary studies. This would be a synthesis of the biological and environmental sciences with the social and cultural sciences.

So what I am advocating is an environmental education that is more than solution oriented, more than an education that will solve our short-term problems, more than an education of requirements to meet professional qualifications, but rather an education that has us ask, So why do we do it? What good is it? Does it teach you anything, like determination, invention, or improvisation, foresight, hindsight, love, art, music, religion, strength or patience or accuracy or quickness or tolerance or how long is a day and how far is a mile, and how to rely on yourself?" So what is the philosophy that Shepard feels needs revival?

What is the perspective that environmental education must have as its goal, its purpose and as its core concept?

Stephanie Mills puts it this way:

> To aspire to survival and to aspire to humanity are the paths. They are one and the same. All the logic, precision and practicality in the world can't save us if we lose our own soul. There can be no survival without passion. Passion for humanity, love of the earth, joy of existence and hope for the future...

It is these concepts that environmental education must embrace. This kind of education will enable man, us, to perceive a sense of time and place within the context of all life.

To teach, in the classical sense of the term, this kind of education is impossible. It will take not just a qualified, degreed teacher, but a leader, one who understands the sense of the awe and wonder of life, not to teach it but to inspire, to help us experience the joy of existence and, thus, a will to survive.

COMMUNITY COLLEGES AND ENVIRONMENTAL EDUCATION

By James M. Ford*

It is generally accepted today that community colleges play a unique role in the American system of education. This role is a dynamic one, involving all segments of a community and people of varying ages. Moreover, the educational pattern in these institutions need not follow traditional lines and the educational process can be conducted at any time, at any place, and in any manner required by the students.

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The executive director of the American Association of Junior Colleges, Edmund J. Gleazer, Jr., has summarized it well: "The community college is a functioning segment of the community, and its mission centers around the education of the young, the continuing education of older citizens, and the general improvement of the community through beneficial and appropriate educational and cultural services." An understanding of what community colleges can do is an important premise for understanding their role in environmental education.

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The most obvious and traditional response of the community college is to offer a course or courses designed to acquaint all citizens (day school students included) with fundamental environmental problems, the severity of the problems, how to attack them, and some of the possible and probable solutions. Since the problems actually involve several of the defined disciplines such as biology, sociology, and chemistry, perhaps the best approach

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is on an inter-disciplinary basis. Whether to use one or a series of courses and whether to involve various disciplines is a matter for each college to determine.

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There is no question that, for various reasons, much emotionalism often surrounds issues dealing with the environment. What really is needed is an objective presentation of the various viewpoints bearing on a specific problem. The community college can be a place for such activity. We usually ask our students to explore both sides of an issue before making up their minds and if we really mean it, we will arrange opportunities for our students to gain exposure to all aspects of the topic under discussion. This can be done in formal classes, through independent study, special adult education classes such as "great decisions" type classes, special forums, and symposiums.

One exciting area of community college responsibility is that of "community service" programs. These programs need not follow the traditional pattern of college classes but can be structured in any manner appropriate to the time and the issue. Perhaps conservation clubs and industry could cooperatively present a program for the general public. Here the proponents of both sides of an issue could be brought together to present their cases; a common platform for debate could be provided. In this way the college could provide the opportunity, even the leadership, for the entire community to hear the pros and cons on any important and timely environmental problem in a rational and democratic atmosphere.

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Frequently specific aspects of an community problem must be studied before value judgments can be made adequately by the people of that community. We have all pretty well decided that we do want a good-quality environment. Some may scream loudly when someone else interacts with the environment to cause pollution; in a milder way, some may wonder if pollution is occurring. Perhaps one of the community college science classes (or independent study classes) could institute an experimental

study or work cooperatively with one of the four-year colleges or universities or with industry on a specific community problem. Such studies could provide a more objective basis for decisions and rational action by all the constituents of a community. Most community colleges have capable scientific personnel and usually, the necessary equipment and supplies for many types of investigation.

Another means of obtaining information pertinent to a specific problem is to utilize the community college libraries which can provide research literand review articles in particular fields. In fact, other agencies in a community may want to utilize the resources of the college to acquire information. A community college is certainly strategically located to investigate the problems of that community.

Finally, a community college can cooperate with other educational agencies (the public schools) in its district for environmental education. This must be done if a coordinated program which presents a logical transition from one level to the next is to be provided for all the people in a community. Furthermore, the community college, often working with the state colleges and universities, can provide valuable in-service experiences for high school and elementary teachers. Each community college has its own outdoor laboratory which is, in reality, its own community. Different problems and different issues exist in each community college district and these can be utilized as learning situations in our education of teachers for environmental education.

Environmental problems are usually complex and involve not only the biological and physical sciences but the disciplines of sociology and psychology.

All of these areas at all levels of education must be brought to bear on all of the important and vital issues of our time. The community college must meet its commitment in its special and unique role in American education by participating in educational activities concerned with a decent environment.